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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/553,754

10/18/2005

Makoto Iida

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25944 7590 04/17/2008

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EXAMINER

MALEKZADEH, SEYED MASOUD

ART UNIT

PAPER NUMBER

1791

MAIL DATE

DELIVERY MODE

04/17/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/553,754	<b>Applicant(s)</b> IIDA, MAKOTO	
	<b>Examiner</b> SEYED M MALEKZADEH	<b>Art Unit</b> 1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 02/19/2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 10-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 10-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 02/19/2008 has been entered.

### ***Response to Amendment***

Claims 1 - 27 are pending.

Claims 1 - 9 and 28 are canceled.

In view of amendment, filed on 02/19/2008, following rejections are withdrawn from the previous office action mailed on 09/20/2007 for the reason of record.

- Rejection of claims 10-27 under 35 U.S.C. 103 (a) as being unpatentable over Iida et al. (US 6,334,896) in view of Fujikawa et al. (US 5,685,907)

### ***New Grounds of Rejection***

***Claim Rejections - 35 USC § 112, 2<sup>nd</sup> paragraph***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 10 – 27 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 10 recite the limitation "the melting point of the raw material" in lines 10-11. There is insufficient antecedent basis for this limitation in the claim.

Claim 11, recites "controlling the value of  $V/G$  ( $mm^2 / ^\circ K \bullet min$ ) in a range from  $-0.000724 \times T_{max} + 1.31$  to less than  $-0.000724 \times T_{max} + 1.38$ ." As recited in the claim 11, unit value of  $V/G$  is ( $mm^2 / ^\circ K \bullet min$ ); however, the unit value for the equations  $-0.000724 \times T_{max} + 1.31$  and  $-0.000724 \times T_{max} + 1.38$  are ( $^\circ C$ ) which is unit value for ( $T_{max}$ ) as recited in claim 10. It is not defined how the value of  $V/G$  is controlled within a range which has a different unit value with the  $V/G$ . Therefore, claim 11 is indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 12, recites "controlling the value of  $V/G$  ( $mm^2 / ^\circ K \bullet min$ ) in a range of  $-0.000724 \times T_{max} + 1.38$  or more." As recited in the claim 12, the unit value of  $V/G$  is ( $mm^2 / ^\circ K \bullet min$ ); however, unit value for the equation

$-0.000724 \times T_{\max} + 1.38$  is ( $^{\circ}\text{C}$ ) which is unit value for ( $T_{\max}$ ) as recited in claim 10.

It is not defined how the value of V/G is controlled within a range which has a different unit value with the V/G. Therefore, claim 11 is indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 13, recites "controlling the value of V/G ( $\text{mm}^2 / ^{\circ}\text{K} \bullet \text{min}$ ) in a range from  $-0.000724 \times T_{\max} + 1.31$  to less than  $-0.000724 \times T_{\max} + 1.35$ ." As recited in the claim 13, the unit value of V/G is ( $\text{mm}^2 / ^{\circ}\text{K} \bullet \text{min}$ ); however, unit value for the equations  $-0.000724 \times T_{\max} + 1.31$  and  $-0.000724 \times T_{\max} + 1.35$  are ( $^{\circ}\text{C}$ ) which is unit value for ( $T_{\max}$ ) as recited in claim 10. It is not defined how the value of V/G is controlled within a range which has a different unit value with the V/G. Therefore, claim 13 is indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 26-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Falster et al (US 2001/0025597)

Claim 26-27 is drawn to a product, which is obtained by the process and therefore will be treated as required via MPEP 2113 [R-1].

“[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” (MPEP 2113[R-1])

As to claims 26-27, Falster et al (US 2001/0025597) teach a silicon single crystal ingot grown in accordance with the Czochralski method, wherein single crystal has a diameter of 200mm. (See paragraph [0129]).

The prior art, thus, meets all the claim limitations, and therefore Falster et al ('597) anticipates claims 26-27.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 10-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iida et al (US 6,048,395) in view of Kitamura et al. (US 2001/0001944)

Iida et al ('395) teaches a method for producing a silicon single crystal by Czochralski method by immersing a seed crystal into a raw material melt and pulling the seed crystal from the melt (See lines 62-67, column 2; and lines 13-24, column 11). Prior art further teaches the pulling rate of a single crystal along the pulling direction of the single crystal represented by  $F$  (mm/min) and the average temperature gradient at a solid-liquid interface of the single crystal represented by  $G$  ( $^{\circ}\text{K}/\text{mm}$ ) wherein the average temperature gradient varies within a temperature range of the silicon melting point to  $1400^{\circ}\text{C}$ , and therefore, the single crystal is pulled with a temperature less than  $1560^{\circ}\text{C}$  (See lines 51-67, column 1 and lines 1-14, column 8; also lines 60-67, column 10) Iida et al ('395) also disclose a defect-free silicon single crystal can be obtained by controlling the value of  $F/G$  such that the value of  $F/G$  falls within a range of  $0.119 - 0.121$  ( $\text{mm}^2 / ^{\circ}\text{C} \bullet \text{min}$ ) at the center of the crystal. (See abstract, lines 51-67, column 7, and lines 1-13, column 8)

As recited above, Iida et al ('395) clearly suggests the average temperature gradient along the pulling direction changes within a temperature

range of within silicon melting point ( $1414^{\circ}\text{C}$ ) to  $1400^{\circ}\text{C}$  and accordingly the temperature controls the value of  $F/G$  within a range of  $0.119 - 0.121$  ( $\text{mm}^2 / ^{\circ}\text{C} \bullet \text{min}$ ) for obtaining a defect free silicon single crystal. By substituting a range of temperatures between  $1400^{\circ}\text{C}$  to  $1414^{\circ}\text{C}$  as a ( $T$ ) in the equations  $-0.000724 \times T + 1.31$  and  $-0.000724 \times T + 1.38$ , a value of between  $0.119$  to  $0.121$  will be obtained. Therefore, the prior art teaches the single crystal is pulled with controlling the value of  $F/G$  as claimed in claims 11-13.

However, Iida et al ('395) is silent about determining a highest temperature ( $T_{\text{max}}$ ) between the crucible and the raw material melt, as claimed in claim 1, and also, Iida et al ('395) fail to teach providing a heat insulating material between the crucible and a heater.

In the analogous art, Kitamura et al. (US 2001/0001944) teach a process for producing an oxide single crystal through rotation pulling by means of a double crucible consisting of an outer crucible, which has similar functionality as a heat insulating material, and a cylindrical inner crucible for intersecting the surface of a melt in the outer crucible and connecting the melt at the bottom of the melt, wherein the outer crucible is positioned between the inner crucible and the heater (4); further, the process comprises pulling a single crystal from the inner crucible (See abstract) which disclosed method has a similar process functionality with the Czochralski method (CZ method). (See paragraph [0025]) Furthermore, Kitamura et al. ('944) teach by employing a



double crucible structure, the change in the temperature of the melt in the inner crucible can be made small, whereby defects in the obtained single crystal will be decreased. (See paragraph [0041]) Therefore, prior art teaches the temperature of the raw material melt at an interface between the crucible inner wall and a raw material melt as ( $T_{\max}$ ) controls the temperature gradient (G) of the melt and the amounts of the defects in the single crystal.

Therefore, it would have been obvious for one of ordinary skill in the art at the time of applicant's invention to modify teachings of Iida et al ('395) by determining a highest temperature ( $T_{\max}$ ) between the crucible and the raw material melt and also providing a heat insulating material between the crucible and a heater in order to stably growing a high quality and longitudinal crystal by rotation pulling, as suggested by Kitamura et al. ('944)

### ***Response to Arguments***

Applicant's arguments with respect to claims 10-27 have been considered but are moot in view of the new ground(s) of rejection.

### ***Remarks***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Seyed Masoud Malekzadeh whose telephone number is 571-272-6215. The examiner can normally be reached on Monday – Friday at 8:30 am – 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin, can be reached on (571) 272-1189. The fax number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published application may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/S. M. M./

Examiner, Art Unit 1791

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/Steven P. Griffin/

Supervisory Patent Examiner, Art Unit 1791